

Discussion paper
Sources of Textile Waste in Australia
January 2009

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About the author: Having held senior positions as Trade Counsellor for the Australian Chamber of Manufactures and as the International Business Manager for several large Australian manufacturers, Kerryn Caulfield now leads her own management and marketing agency, Apical International, specializing in industry association management. As well as "hands on" industry experience, Kerryn has participated in numerous Government and industry committees and forums specifically to design and formulate industry policy. She was recognised by the Australian Trade Commission and the College of International Business for contributions towards Australian exports. Kerryn is currently the Executive Manager of the Technical Textiles & Nonwoven Association, Composites Australia and a Board member of the International Fibre Centre and Member of the Victorian Government's "State of Design" Advisory Committee.



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1 Background

The textiles, clothing and footwear (TCF) industry in Australia comprises approximately 680 firms, with more than 50% concentrated in Victoria. As well as being the supplier of textile related materials to consumers, the industry also supplies materials to other manufacturing sectors including automotive, filtration, mining, building, marine, composites and outdoor protection. One of the many sustainability issues facing the industry is the quantity of textile waste that is sent to landfill at great cost to the industry and the taxpayer. It is not only the TCF companies which generate textile waste, but also their customers in the industrial manufacturing sector. This report outlines the issues, questions, and the scope of the problem, as well as providing insight into the potential economic and environmental benefits that re-use of this resource may offer.

2 Introduction

Waste has been defined as any product or substance that has no further use or value for the person or organisation that owns it, and which is, or will be, discarded¹. However, what may be discarded by one party may have value to another. Thus, the definition for 'waste' should be redefined to consider this waste as a potential reusable resource for others.

The amount of waste we generate, and its actual or potential negative effects on the environment, are matters of concern to governments, industry and the community. Australia has been described as being a high producer of waste when compared to other developed economies.²

There is a wide variety of wastes and waste streams, each with different environmental impacts. This paper is an introduction to the issue of textile waste in Australia. The aim is to open discussion on the issue, to provide a framework upon which to develop policies and programs to assist management of the issue and to quantify & qualify the waste discarded by Australian industry.

In producing this paper, it became evident that the limited and inadequate data available in Australia is an impediment to intelligent and effective recovery and/or regeneration of textile waste. This paper therefore advocates that an initial study be commissioned on textile waste in Australia. In advance of this study, each section documents a number of practical initiatives (noted as "Authors comments") that became obvious in researching for this paper. No doubt further initiatives will be come apparent as this project progresses.

2.1 Waste is a problem

Waste is perceived to be a problem for many reasons, but the three reasons most often cited are that: waste disposal can harm the environment and human health; space for landfills is claimed to be becoming scarce as councils strive for zero waste targets; costs are increasing to use existing and

¹ Waste Management – Productivity Commission Enquiry No. 38 2006

² Waste and Recycling in Australia, Hyder Consulting Nov. 2008



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replace landfills and waste is the end of a products life cycle that causes costly environmental impacts and depletes valuable resources. Some people also take an essentially moral view of waste generation, arguing that it is symptomatic of wasteful and undesirable overconsumption.³

The main method of waste disposal in Australia is landfill. Textile waste in landfill contributes to the formation of leachate as it decomposes, which has the potential to contaminate groundwater. Another product of decomposition in landfill is methane gas, which is a major cause of greenhouse gases, significantly contributing to global warming, although it can be utilised if collected. The decomposition of organic fibres and yarn such as wool produces large amounts of ammonia as well as methane. Ammonia is highly toxic in both terrestrial and aquatic environments, and can be toxic in gaseous form. Cellulose-based synthetics decay at a faster rate than chemical-based synthetics. Synthetic chemical fibres can prolong the adverse effects of both leachate and gas production due to the length of time it takes for them to decay. In the past textile waste has been incinerated in large quantities, emitting organic substances such as dioxins, heavy metals, acidic gases and dust particles, which are all potentially harmful to both humans and the environment⁴.

2.2 What is “textile waste”?

Like all wastes, textile waste originates from the community via a number of streams including the fibre, textile and clothing manufacturing industry, consumers, the commercial and service industries. These are defined as pre-consumer, post-consumer and industrial textile waste.

2.2.1 Pre-consumer textile waste

Pre-consumer textile waste is manufacturing waste that is generated by processing fibres, (be they natural or synthetic fibres) and the production of finished yarns and textiles, technical textiles, nonwovens, garments and footwear, including off-cuts, selvages, shearings, rejected materials and/or B-grade garments. Whilst “cabbage” (over estimated fabric meters and off-cuts of saleable size) has for many years, been resold into markets or made-up into smaller items, most pre-consumer textile waste in Australia is simply sent to landfill. Pre-consumer textile waste is usually “clean waste”. Firms either arrange their own waste disposal services or use council managed services and pay landfill fees according to how much is dumped.

2.2.2 Post-consumer textile waste

Post-consumer textile waste consists of any type of garments or household textile (such as sheets or towels) that the consumer no longer needs and decides to discard, either because they are worn out, damaged, outgrown, or have gone out of fashion. This category has typically been of reasonable to good quality garment that can be recovered and subsequently recycled by another user as second-hand clothing, much of which is sold to third-world nations. Clothing that is unlikely to be worn again is potentially functional as it may be shredded into fibre to be used in products similar in nature to those manufactured from pre-consumer textile waste.



³ Waste Management – Productivity Commission Enquiry No. 38 2006

⁴ www.wasteonline.co.uk



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2.2.3 Industrial textile waste

Industrial textile waste is generated from commercial and industrial textile applications including commercial waste from properties such as carpets and curtains, hospital refuse in addition to industrial applications such as filtration, conveyor belting, etc. Industrial textile waste is usually “dirty waste”. Collection and chemical contamination issues render this category as the least likely to be recovered in Australia. A substantial proportion of these end-of-life goods are consigned to landfill. However, there is research currently being undertaken by a number of industries, including the carpet industry, to utilise this resource.

3 Recovery of textile waste

The organised recovery of textile waste can be traced back as far as the old clothiers, many of whom were farmers involved in the cottage industries in all stages of textile production. The practice of recovering waste is as old as the art of spinning and weaving. Shoddy and mungo were invented when old clothes were ground back into a fibrous state that could be re-spun into yarn. The shoddy industry, which was centred around West Yorkshire in the UK and Prato in Italy, concentrated on the recovery of wool from rags. The importance of the industry is gauged by the fact that even in 1860 the town of Batley was producing over 7000 tonnes of shoddy. At the time there were 80 firms employing a total of 550 people sorting the rags. These were sold to shoddy manufacturers of which there were about 130 in West Riding. Since these early days most countries have operated waste textiles industries, Prato in Italy being a prime example.

Today, recovering textile waste is a multi-billion dollar global industry that performs a vital social and environmental function and provides employment for millions of people all around the world. An internet search on “textile waste” will elicit more than 2,664 products or listings, including headings such as hosiery cuttings and clips, polyester tow, cotton shoddy, used clothing wiping rags, denim/jean clippings, 100% cotton yarn waste, silk fibre waste, etc.

In Australia the organised recovery of post-consumer textile waste is mainly undertaken by charities such as the Brotherhood of St Laurence, St Vincent De Paul and Life Line, although in recent times a small number of private operators have entered the market. Collection is mostly of second hand clothing (post-consumer waste) by means of community donations deposited into charity bins, thousands of which are located across Australia, and/or drop-offs directly to charity shops. The role of the charitable organisation is covered in Appendix 1.

3.1 Textile waste recovery options

The vision of every organization and municipality is to recycle all of its waste into usable products, thereby closing the life-cycle loop. Science teaches us that matter and energy are not destroyed, they merely change state. Waste contains significant amounts of valuable resources that were once used as a raw material. Those products have lived their useful lives and have become waste, but they still contain the same matter and energy that went into their making. Logic suggests that by recovering textiles, the demand for virgin resources is reduced. Material washing and energy consumption still occur in the recycling processes, but they are considerably less resource intensive and polluting than the processes involved in manufacturing textiles from virgin fibre. Importantly, the virgin fibre processing industry in Australia has downsized to a few firms with significant volume imported



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annually. The potential re-invigoration of the fibre industry driven by sustainable regenerated fibre exists.

There is very little evidence of organised recovery of pre-consumer or industrial textile waste specifically for reprocessing, in Australia. However, with investment in appropriate technology, there are a number ways by which textile waste can be recovered.

3.1.1 Recycle/reuse

The multi-billion dollar worldwide recycling industry performs a vital social and environmental function. The industry has no peer in terms of conserving the world's resources while the various stages of the recycling process provide significant employment around the world.

As mentioned previously, garments or household textile (such as sheets or towels) can effectively be recycled by sale or gift to another user. The UK based Recycling Association, estimates that up to 95% of the textiles that are landfilled each year could be recycled. Of the textile waste recovered by the charities, 60% is items of clothing that can be reworn or reused and 15% can be torn into industrial wiper cloths. Disturbingly, 25% is unusable and sent to landfill. The role of the charitable organisation is covered in Appendix 1.

3.1.2 Regenerating Textiles

All textile waste streams (those detailed previously) are often unrealised sources of valuable raw materials that can be repurposed or regenerated into saleable and usable products by intelligent collection, sorting, reengineering and reprocessing. In essence, the liability of "waste" is turned into an asset often based on intellectual property (IP) which has been specifically developed. Processing machinery is also likely to be engineered to produce a specific product ...and thus the investment in developing regenerating capabilities is often large-scale. Products made by regenerating textile waste include acoustic textiles used for soundproof blocks, insulation, roofing felt, bank stabilisation, and as pollution control filters. Examples are best illustrated in the following case studies:

Australian Case Study: The Smith Family's Commercial Enterprise (TSF) located in the Sydney suburb of Villawood is a manufacturing facility that was established in 1987, as a means of utilising textile industry waste and the tonnes of surplus clothing that weren't suitable for either sale through TSF's retail outlets or for export.



The first of three specialised lines went into operation to produce nonwoven fabrics from regenerated fibres. Carpet underlay, furniture removal felt, weed suppression and water retention felts are just some of the examples of products produced by the manufacturing line. Through the creative and innovative commercial utilisation of what would otherwise be waste product destined for landfill, TSF is able to convert hundreds of tonnes of waste clothing and material into manufactured non woven textile felts and fabrics.

In 1992, a significant investment was made and the second manufacturing line became operational



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enabling the Commercial Enterprise to significantly expand its capabilities and manufacture a more extensive range of felt and fabric products. In 2004, as the result of a strategic business review and the support of the Federal Government's Strategic Investment Program (SIP), TSF invested in the growth potential of its nonwoven textile operation and committed to an additional manufacturing line that would increase the output capacity by 6,000 tonnes annually to over 10,000 tonnes annually from the Villawood operational centre.

"It's our goal to use technology and innovation to efficiently and responsibly transform materials and resources many regarded as waste, into marketable products that benefit the Australian economy and environment. The long term societal benefit is also important because it means the Commercial Enterprise can contribute funds to enable TSF's Social Enterprise to support more Australian disadvantaged children and help them reach their potential through education," concluded Cathy Bray, CEO TSF.

The potential to increase the use of textile waste is however restricted, as the organisation has limited shredding capacity. The main source of fibre for recycling is derived from the TSF clothing collection & sorting operation.

North American Case Study: Circle™ is a company with a 25 year history of developing the science of re-generation, particularly that of textile waste. It's catch phrase is to allow it's manufacturing partners to "turn circle™". The company directors philosophy is based on a strategy of research, develop, innovation and IP as it promotes to "owning over 12 "game changing" re-generation patents in key commodities".

One patent area trademarked "Altfab™" encompasses the collection and re-processing cotton textile waste from the cutting floor of a garment manufacturing facility into consumerwipes. Another trademarked "Flip™" utilizes denim waste, (once again from a garment manufacturing facility) to produce packaging made into carry bags and wrapping paper. Other patents include technology to turn leather scraps into book covers and auto seating and utilizing wood waste to manufacture moldable tiles, trim and panels.

Supporting these technologies is the Sustainable Solutions Network™ which is the brain child of Ms Joy Nunn who developed many of the regenerating technologies. The network is a formal association of companies dedicated to supply the pre-consumer waste that would otherwise find itself in land-fill.

Strateline Industries, which is the 250,000-square-foot nonwoven manufacturing facility supporting the initiative, was an collective investment of \$63 million in the production of continuous roll-good nonwoven substrates from recycled post-industrial materials — primarily cotton, producing the first-ever sustainably repurposed cotton nonwoven materials



Foolsap suspension files made from 100% recycled fibre and complete with tabs and inserts

Japanese Case Study: Patagonia has partnered with Japanese textile firm Teijin to implement a polyester product recycling program which started in Aug 2005. Under the



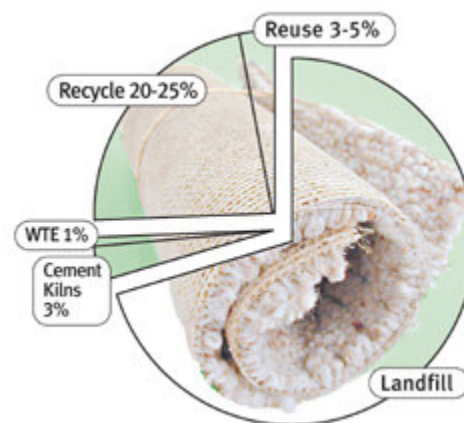
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program, Patagonia will recover from customers used Capilene undergarment products. Teijin will recycle them as polyester materials at a "fiber-to-fiber" recycling facility in Teijin Fibers' Matsuyama plant. In 2005, Patagonia began using a new PCR filament yarn containing 30%-50% post-consumer feedstock made from discarded soda bottles, polyester uniforms, tents, and garments. *The remainder of the yarn comes from post-industrial feedstock -- yarn and polymer factory waste products.*

"We're constantly trying to innovate our supply chain," says Jill Vlahos, Patagonia's director of environmental analysis. "Everything we make pollutes, but we're trying to improve every step of the way. We're excited to create our own supply rather than pulling from raw virgin resources." Vlahos is careful to note that while the recycling program does not save money, it adds no extra costs to the manufacturing process. "We're trying to inspire other businesses to move in an environmental direction, and the only way we can do that is to run a profitable business," says Vlahos. "The added expense of recycling and logistical costs is offset by the fact that we don't have to purchase or create raw polyester material."⁵

There are other examples. The Australian Carpet Institute (CIA) is looking to follow the example of the North American, Carpet America Recovery Effort (CARE) which is a joint industry-government effort to increase recycling and reuse of post-consumer carpet and reduce the amount of waste carpet going to landfills (www.carpetrecovery.org). CARE was established as a result of a Memorandum of Understanding for Carpet Stewardship (MOU), a national agreement signed by members of the carpet industry, representatives of government agencies at the federal, state and local levels, and non-governmental organizations. CARE's mission is to develop market-based solutions for recovering value from discarded carpet to meet the goals of the negotiated outcomes. To accomplish its mission, CARE facilitates, advises, provides resources, and serves as a forum for the many different stakeholders. CARE is funded and administered by the carpet industry, which agrees to use CARE to:

- Enhance the collection infrastructure for post-consumer carpet.
- Serve as a resource for technical, economic and market development opportunities for recovered carpet.
- Develop and perform quantitative measurement and reporting on progress toward the national goals for carpet recovery.
- Work collectively to seek and provide funding opportunities for activities to support the national goals for carpet recovery.⁶



CARPETAMERICARECOVERYEFFORT™

⁵ www.greenbiz.com

⁶ www.carpetrecovery.org



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The business of regenerating pre-consumer and post consumer waste in Australia is promising. It has the potential to found a new industry and green jobs while mitigating land fill and at the same time as providing green inputs to external industries such as the automotive industry. A concept to operate with zero land-fill grew into the potential for a commercial product for the Melbourne based company I.N.C.. With the assistance of a Commercial Ready grant from AusIndustry, the company have a patent pending in the US for a process that can take mixed textile waste and turn it into something useful – as a short-fibre nonwoven textile. “*We can source waste from pre-consumer, post-consumer, and industrial textile sources. We can even (theoretically) take waste carpet and turn it into a short-fibre nonwoven textile. With our process, we can take laminated textiles (films, foams, etc), moulded textiles, adhesive backed waste, and put it all through the same process*” says the company’s Managing Director, Michael Coates.

Authors comment: *The North American, Carpet America Recovery Effort (CARE) is a sterling example of an industry and government partnership fortified by agreed national goals to significantly increase the amount of recycling and reuse of post-consumer carpet. By 2012, the parties plan to achieve a landfill diversion goal of 40%. These goals can be viewed as steps toward fulfilling a long-term commitment by the carpet industry for the eventual elimination of land disposal, incineration, and incineration with energy recovery (waste-to-energy) of waste carpet. Support should be provided for investigating the establishment of a national carpet recycling program in Australia.*

4 Industry as a source and solution of waste

The TCF sector is a significant manufacturing sector of the Australian economy. As outlined previously, during the processing of textile products, large amounts of pre-consumer fibrous waste can be generated in the form of off-cuts, selvages, shearings and rejected materials. Whilst the TCF companies generate textile waste, the North American Case study (detailed previously) demonstrates that fibre and textile technology can be applied to regenerate textile waste into merchantable products. Concerted waste resource recovery strategies practiced within TCF production facilities would corral significant volumes away from landfill that could be regenerated.

Fibres are recovered from pre and post consumer waste through the process of shredding. This process shortens conventional fibres and thus regenerating technology relies on short fibre technology. Common to the products made from short fibres outlined in the case studies is the use of nonwoven and composite technologies both of which are available in Australia. Nonwovens are a fabric formed of textile fibres that are held together by mechanical interlocking in a random web or mat, by fusing the case of thermoplastic fibres or by bonding with a cementing agent. Both synthetic and natural fibres are used in manufacturing technical and nonwoven textiles. The selection and combinations of fibres used determine the ultimate end product properties, cost and subsequent applications.

As this is in the sphere of manufacturers’ research and development and product development programs, knowledge coupled with appropriate and targeted investment would encourage new business models for fibre regenerating technologies.

Authors comment: *Textiles are manufactured to perform a wide range of functions and are made up of different types of fibres mixed in varying proportions. While the textile industry has become highly efficient, a large proportion of unnecessary waste is still produced each*



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year. Sound waste management practice by fibre, textiles and garment manufacturing companies can significantly reduce operating costs. An examination of waste production to assess process changes that will reduce off-cuts and maximise the efficient use of raw materials can reduce both the purchasing costs of raw materials and the costs of waste disposal. Such process changes may entail:

- *the adoption of a more efficient product design*
- *the implementation of more efficient practices and procedures*
- *the introduction of more efficient machinery.*

The proposed TCF Innovation Capability Program should include a financial incentive program for the companies to invest in waste management strategies at source as a priority.

However, there will always be a degree of waste in a textile manufacturing process especially from fabrication, edge trim, etc., despite process innovation and improvements. The area of innovation that best improves sustainability is to create applications for this waste.

5 Barriers to recovering textile waste

There are numerous political, economic, social, technological, environmental, legal and institutional barriers to the improvement of resource recovery in Australia. Following are some evident barriers.

5.1.1 Knowledge

In order to manage an environmental issue, it must first be measured and quantified. The limited and inadequate data available in Australia regarding the amounts and types of textile waste is an impediment to intelligent and effective recovery and/or regeneration of textile waste. This paper advocates for a study to be commissioned on textile waste in Australia.

Knowledge and thus solutions to the decontamination and calorific separation of noxious chemicals that may be imbedded in textiles used for industrial applications, such as filtration will only be achieved through research and collaboration between industry and research agencies.

5.1.2 Policy

There is limited effort to stimulate resource recovery through policy instruments that influence recycled demand and, thereby, create greater pull in the resource recovery system. On the one hand, and in contrast to overseas jurisdictions, there are very few targets, financial incentives, or mandatory requirements in terms of recycled content purchasing for public sector agencies.⁷

Some state governments have zero waste strategy targets to increase resource recovery rates within a designated time frame. To reach these targets, these strategies should be supported by programs that utilise this waste.

Regeneration verifiably reduces the environmental impact of carbon emissions, energy use and toxic chemical by up to 70%⁸. Certainly, investment in systematic, investigative and experimental activities that involve research, development and innovation for the purpose of acquiring new knowledge or

⁷ Hyder Consulting Pty Ltd ABN 76 104 485 289

⁸ Strateline Industries presentation: November 2008



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creating new or improved materials, products, devices, processes or services to regenerate textiles will positively serve the Australian economy and reduce our environmental footprint. However, there has been limited effort to stimulate the recovery of textile waste through policy instruments. Discussion on the issue is embryonic and there has been little analysis by industry or government. Indeed, the recent review of the Australian TCF industry commissioned by the federal government did not address the issue as it was not within the scope of the review. However, many of the submissions to the review process recognised the need for further analysis with a view to developing both green policies and initiatives.

Noting this oversight, in its submission to the TCF Review, the Technical Textiles and Nonwoven Association called for support to be provided for investigating the establishment of a national carpet recycling program; and for a Cooperative Research Centre for sustainable products and plastics, including the reprocessing or de-polymerisation of materials to be established with the textile/carpet sector. This included government RDI funds for converting textile and apparel waste streams into energy that can be used and/or fed back into the power grid.

Authors comment: *Sorting to separate fabric composition and fibre types is a critical process in recovering textiles. Complex compositions of fibres make separation more difficult and more costly, and this has implications for the profitability of textile recycling. The charities that contributed to the TTNA's submission called stronger legislation on fibre content on garment labelling to assist easier collection and sorting. An example of the impact of this is that denim is unsuitable as being recycled for industrial rags, despite being absorbent. It is therefore disposed of in landfill often at a cost, as denim jeans end up in charity recycling bins as they are still classified as "clothes" by consumers. This highlights the need to raise public awareness of what may be recycled. However this fabric could be used by an industrial end-use (refer Flip™ in section 3.2.1).*

5.1.3 Financial

The recycling industry's contribution to protecting the environment would not be possible without its significant expenditure on often highly sophisticated plant, machinery and equipment. Indeed, it has been calculated that the industry - which comprises a large proportion of privately-owned enterprises - invests around US\$ 20 billion each year on new equipment and research & development⁹. To that end, government policy is the instrument that will encourage investment in an industry that will regenerate textile waste.

5.1.4 Research and development

The examples outlined in the previous section are the results of both investment and technologies that have been specifically developed to solve textile regeneration issues. Research, development and innovation have long been pillars of the Australian fibre, textile and clothing industry and can be accredited with much of the industry's advancement. Regenerating issues such as the extraction of chemical contaminants, and the development of end use products can only be solved by RDI and an industry and government commitment not dissimilar to the North American, CARE program.

Authors comment: *In recognition that investment in systematic, investigative and experimental activities that involve research, development and innovation for the purpose of*

⁹ The Bureau of International Recycling website



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acquiring new knowledge or creating new or improved materials, products, devices, processes or services to regenerate textiles will positively serve the Australian environment; this paper calls for policy that supports RDI for the recovery of textile waste.

Authors comment: *In its submission to the TCF Review, the Technical & Nonwoven Textile Association called for support should be provided for investigating the establishment of a national carpet recycling program; and for a Cooperative Research Centre for sustainable products and plastics, including the reprocessing or de-polymerisation of materials to be established with the textile/carpet sector. This included government RDI funds for converting textile and apparel waste streams into energy that can be used and/or fed back into the power grid.*

Authors comment: *There is the opportunity to develop knowledge networks to develop pre-consumer waste solutions and resulting products.*

5.1.5 Community awareness

Recovery of post-consumer textile waste is dependent on donations from the public. Australians' attitudes toward waste issues are complex and constitute a barrier to improved resource recovery.¹⁰ The increased use of recycled materials in products and the increased recovery of material for recycling can be achieved with an educated public. Certainly the National Association of Charitable Recycling Organisations (outlined in Appendix 3) advocates for the community to become more educated and aware about donating goods in a way that provides maximum profits for charity and minimum cost to the environment. The charities that contributed to the Technical Textiles & Nonwoven Association's (TTNA) submission called stronger legislation on fibre content on garment labelling to assist easier collection and sorting. Other initiatives include providing the public with information on bin and store locations.

Authors comment: *Recovery of post-consumer textile waste is dependent on donations from the public. The increased use of recycled materials in products and the increased recovery of material for recycling can be achieved with an educated public. The North American based Secondary Materials and Recycled Textile Association (SMART) has introduced a label for use by garment manufacturers that clearly instructs the consumer on the recyclability of the garment.*



6 Trade in textile waste

All countries with industrial production capacity have a need to consume raw materials and so demand for recycled commodities is truly global. International trade in secondary materials is necessary to supply steelworks, foundries, paper mills, textiles industry and rubber etc. with feedstock material for further environmentally sustainable production. As the focus of industrial production shifts away from industrialised nations towards the developing world, so there is also a shift in flows of secondary raw materials. Today, for example, huge volumes of scrap metal recovered from end-of-life products in the Western World are being shipped to China and other, rapidly-

¹⁰ Hyder Consulting Pty Ltd ABN 76 104 485 289



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industrialising countries in Asia. Put simply, there is potential to achieve a return on investment through trading in waste. Appendix 2 outlines the annual exports from Australia of approximately 50,000 tonnes of textile waste to 44 countries, most of which are in the third world. There is little data available for exports of pre-consumer textile waste.

7 Facts and figures

Until recently there were no formal study/ies on textile waste conducted in Australia, facts and figures tended to be anecdotal and reasoned from overseas studies. However, there are no definitive figures for the volume pre-consumer textile waste from fibre, textile and garment manufacturing operations, and industrial textile waste generated from commercial and industrial usage, most of which is consigned to landfill.

In September 2008, the Carpet Institute of Australia completed a study of resource flows for the carpet sector in 2007 with the intention of developing industry plans to improve resource utilization efficiencies across the lifecycle of carpet from manufacture to the end of life. Particular emphasis was placed on carpet wastes as these are a prominent source of construction and demolition waste as well as commercial wastes sent to landfill.

A number of waste composition studies in Australia indicate that unrecovered textile waste accounts for approximately 4 percent of the content of our landfills. These statistics are an aggregate of all sectors in the TCF industry (i.e. pre-consumer, post-consumer and industrial). Data on the US Environmental Protection Agency website is in accord with this, noting that:

- *An estimated 11.9 million tons of textiles were generated in 2007, or 4.7 percent of total municipal solid waste (MSW) generation.*
- *The textile recycling industry annually prevents 2.5 billion pounds (1.2 billion kilos) of post consumer textile product waste from entering the solid waste stream, according to the Council for Textile Recycling.*
- *This 2.5 billion pounds of post consumer textile waste represents 10 pounds for every person in the United States.*
- *Approximately 500 million pounds of textiles collected are used by the collecting agency, with the balance sold to textile recyclers, including used clothing dealers and exporters, wiping rag graders, and fiber recyclers.*

To demonstrate the size of the industry, the site also estimates that *"more than 500 textile recycling companies handle the stream of used textiles in the United States. As a whole, the industry employs approximately 10,000 semi-skilled workers at the primary processing level and creates an additional 7,000 jobs at the final processing stage. Primary and secondary processors account for annual gross sales of \$400 million and \$300 million, respectively."*

In order to manage an environmental issue, it must first be measured and quantified. To that end the limited and inadequate data available in Australia is an impediment to intelligent and effective recovery and/or regeneration of textile waste and unacceptable. A study should be commissioned in the interest of the community.



8 A preliminary initiative for textile waste

As mentioned in the introduction, this paper is an initial attempt to scope the issue of textile waste in Australia. The aim is to open discussion on the issue, to develop policies and programs to assist the intelligent management of the issue and to elicit industry support for these undertakings. The limited and inadequate data available in Australia is an impediment to intelligent and effective recovery and/or regeneration of textile waste. This paper advocates that the preliminary initiative be the commissioning of a study on textile waste in Australia.

Appendix 1: The role of charitable institutions in the recycling/reuse textile waste

The organised recovery of post-consumer textile waste (mainly used clothing) in Australia is mainly undertaken by charities, in contrast to overseas, where there are more private textile waste collectors, merchants and traders. However a small number of facility management agencies have recently entered the Australian market.

According to an estimate from the U.K based Council for Textile Recycling, nearly half of textiles discarded by the community are contributed to charities that either give them away or sell them at discounted prices in secondhand stores. It is further estimated that about 61 percent of the clothes recovered for second-hand use are exported to foreign countries. Through the efforts of this industry approximately 75 percent of the pre-consumer textile waste that is generated is diverted from our landfills and recycled¹¹ and that the world's poorest are clothed.

The collection of second hand clothing (post-consumer waste) is by means of community donations deposited into charity bins, thousands of which are located across Australia, and/or drop-offs directly to charity shops. Once collected, the textiles are sorted and graded before being sent to various destinations according to quality and the need of the community. Experienced workers who can distinguish between the various types of fibre carry out the sorting. Quality is also an important factor. Given that the business of these charities is to clothe those in need in the community and to generate social capital to fund welfare programs, these organisations don't classify themselves as textile waste collection agencies.

Some collection points are large facilities. The Smith Family's Villawood operations employs 14 drivers to service between 700 and 800 bins located around NSW. The facility processes 40 tonnes of waste per day. To put this into perspective a single tonne of textiles fills roughly 200 black bin bags.

A representative of the Australian National Association of Charitable Recycling Organisations estimates that over 50 million kilos of textile waste is collected by Australian clothing recyclers through charity bins and donations. Much of this can be reclaimed and recirculated through charity shops or reprocessed into functional textiles. However, 12.5 million kilos are unsuitable for reclamation and is sent to landfill.

¹¹ The Textile Recycling Association in the United Kingdom



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A percentage of textile waste donated to the charities is unusable and sent by the charities to landfill at considerable cost. The introduction of “pay-as-you-throw” charges for the use of a local dump or transfer station a few years ago coupled with community laziness, increased the amount of unusable donations to the charities as households attempt to avoid these costs. One large charity alone spends (annually – nationwide) approximately \$5 million on cleaning up waste which is mainly dumped on it, in one form or another. Of that amount, it estimates that approx. \$2 million goes towards landfill expenses, which is obviously only part of the overall waste cost it faces.

Also a reduction in curbside hard waste recycling services by local councils has resulted in an increase in consumers disposing of waste through donating to charitable organisations.

Charity bins sites are often used as a dumping site for unwanted rubbish and the cost of collection and disposal of this material is a serious financial burden on these organisations and is diverting funds from welfare programs into waste disposal. One large charity received 635 call outs in the month of December 2008 to clean-up rubbish dumped around bins. There is no doubt that the regulation of landfills will continue to tighten. Any efforts to lessen this objectionable impost would be an intelligent and worthy undertaking. Indeed, there is no doubt that without these honourable organisations, both State and Federal governments would have significantly higher social costs in addition to an unmanageable volume of landfill, the management of which would be funded through increased taxes and a massive bureaucracy.

According to the Brotherhood of St Laurence submission to the TCF review, one way to reduce the amount of textiles not being re-used would be to support charities involved in garment recycling to build their capacity to recycle donated goods that cannot be re-sold through their stores. This should include technology development for sorting used clothing and research into fibre reclamation and recycling technology.

Like all businesses, the charities are subject to a common and complex supply and demand pressures. In good times, donations increase and demand is less. However in bad times, such as the current global economic crisis, supply reduces significantly as people cut spending and hold onto possessions and demand from those in need increases.

Authors comment: *For the sorting occupation, the Australian charities rely on volunteers and work-for-the-dole recipients who are unlikely to be educated in fibre and textiles, and more likely to be semi-skilled or marginally employable workers. An education program designed for workplace delivery would increase the competence of these workers, the result of which would be greater recovery and effective diversion from landfill.*

Authors comment: *Sorting to separate fabric composition and fibre types is a critical process in recovering textiles. Complex compositions of fibres make separation more difficult and more costly, and this has implications for the profitability of textile recycling. The charities that contributed to the Technical & Nonwoven Textile Association’s (TTNA) submission called stronger legislation on fibre content on garment labelling to assist easier collection and sorting.*

Authors comment: *There is an opportunity for Australian textile RDI agencies to work with the charities to solve landfill dilemma’s. This could involve the development of a network to reuse flock from recovered mattresses.*



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Appendix 2: Exporting post consumer textile waste

There exists a healthy international market for post consumer textile waste. In Australia the two relevant tariff codes are as follows:

- 63090010 the description for which is "Worn clothing", and
- 63090090 the description for which is "Worn textile articles (excl. clothing)" which includes shoes, handbags etc.

The Australian Bureau of statistics records that in the above two tariff categories, approximately 50,000 tonnes is exported annually to 44 countries, most of which are in the third world. This equates to around 2,500 40 foot shipping containers. The major destination is the United Arab Emirates, no doubt for transshipment to gulf countries. Malaysia is the second largest importer of textile waste from Australia, with Pakistan and New Guinea running third and fourth. African nations such as Togo, Tanzania, Mozambique, Nigeria, Tunisia, Dem Rep of Congo, Zaire, Zambia, Benin and Malawi and all large emerging recipients of Australian charitable clothing donations; so too south pacific nations such as Papua New Guinea, Kiribati and Vanuatu, to name a few.

Regardless of their final destination, used textiles have a relatively stable and reasonable price that, like all exports is influenced by exchange rates and larger overseas competitors.

While of second hand clothing makes up a small part of global trade in textiles and clothing, for some countries it plays a more important role than for others. The trade supports hundreds of thousands of livelihoods in developing countries. These include jobs in trading, distributing, repairing, restyling and washing clothes. Oxfam's research in Senegal estimates that 24,000 people are active in the sector in that country.¹²

The major exporters of worn clothing and worn textile articles are the large charities such as the Smith Family Enterprise and Life Line. The multi faceted benefits of these exports cannot be underestimated. While ameliorating poverty in the receiving country, these shipments mitigate Australian land fill and at the same time as earning export income for Australia; the earnings for which provide Australian charities with social capital that is reinvested into welfare programs.

Appendix 3: Post-consumer waste representative bodies

There are a number of organisations representing the textile waste industry around the world, with the most unified in the United Kingdom and North America.

Desk top research has identified Textile Recycling Organisation and the Secondary Materials and Recycled Textile Association (SMART) in the US and the Textile Recycling Association in the United Kingdom. The goals of these organisations are to increase the amount of textile waste that can be recovered and at the same time develop new uses, products and markets for products derived from pre-consumer and post-consumer textile waste. The aims align with environmental agencies goals...which are to encourage the trends toward (1) increased use of recycled materials in products and (2) the increased recovery of material for recycling.

¹² The impact of the second hand clothing trade on developing countries; Sept 2005, S Baden & C Barber for Oxfam



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Additionally, the Bureau of International Recycling based in Brussels has a textile chapter and hosts the World Recycling Convention & Exhibition that will be held in Dubai from (24) 25-27 May in 2009.

In Australia, the National Association of Charitable Recycling Organisations (NACRO) is the peak body representing a broad spectrum of charitable recycling organisations.

The National Association of Charitable Organisations in Australia (NACRO)

NACRO provides a forum for the exchange of ideas, information and advice between member organisations; assisting them to continuously improve their recycling operations so that they can provide optimal funding for their charitable aims in the community¹³.

Whilst membership of NACRO is confidential, it can be illustrated by the organisations that were represented at the annual NACRO conference, including:

- Lifeline
- Uniting Church / Goodwill
- Presbyterian Social Services
- Adventist Development & Relief Agency Australia
- The Smith Family Enterprise
- YMCA
- Salvos Stores
- The Asthma Foundation
- Living Water Uniting Church
- Careworks Australia
- Anglicare

The business of its members is to generate social capital to fund welfare programs. Indeed, millions of individuals benefit from the products, operations, and programs created by the members of this organisation. Through its efforts this industry diverts approximately 75 percent of the pre-consumer textile waste from our landfills.¹⁴

NACRO advocates educating the community to donate goods to provide maximum profits for charity and minimum cost to the environment. It represents its members at a local, state and national level, when legislation affecting this industry is being drafted or reviewed.

Appendix 4: Industry representative bodies

The Technical Textiles and Nonwoven Association (TTNA)

The TTNA has a proven and successful history of connecting with all levels and elements of the TCF sector. Indeed, it was formed in 2000 in response to the findings of the TCF Action Agenda which recommended a forum be established for the dissemination of both Australian and international research, development and innovation in fibre and textile manufacturing, processes and education in Australia. The TTNA was established by industry as a formal

¹³ NACRO website

¹⁴ The Textile Recycling Association in the United Kingdom



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network to satisfy this need. The purpose and powers of the TTNA clearly reflect this. Its mission is to advance, represent and foster the development of the industry and particularly to:

- provide a forum for discussion of issues facing the industry;
- encourage an internationally competitive and innovative industry;
- form collaborative links with other industry and business organisations, including education and research and development organisations;
- foster the growth of an appropriately skilled and sustainable workforce in the industry through world class training;
- develop and support networks of communication within the industry;
- compile statistical information on revenue, exports, research and development of the industry;
- promote the industry both locally and internationally;
- encourage research and development and innovation in the Industry;
- represent the interests of the industry to government bodies.

Composites Australia

Composites are structural products that are a combination of dissimilar constituent materials. The overall engineering performance characteristics of a finished composite far exceed those achievable from any of the individual components used in isolation. Composites are advanced manufactured materials which offer a myriad of solutions and end uses for a myriad of industry sectors.

The association represents fabricators, manufacturers, providers of services and suppliers of raw materials within the composites industry. It provides a forum for the industry to exchange information and promote the development of new markets for composite products. The main objective of Composites Australia is to increase the awareness and general usage of composites in Australia addition to:

- Representing its members' interests to government and other authorities, insurance companies, consumer organisations and media.
- Developing a standard of commercial ethics amongst members.
- Developing the skills base of the industry.
- Providing a forum for discussion on subjects of common interest.
- Liaising with other industry groups within Australia and overseas.

